

WHAT IS CLAIMED IS:

1. A substantially rigid aqueous clear gel matrix air freshener article comprising:

- (a) an air freshener gel matrix body having a volume V_o which decreases on use of said air freshener article whereby $dV_o/d\theta < 0$ comprising water, a surfactant, a clear gel matrix material selected from the group consisting of a polysaccharide gel matrix material and a hydrolyzed protein gel matrix material, and, optionally, a system-compatible air freshening fragrance composition;
- (b) fully imbedded within said air freshener body, one or more icons which are each visibly distinct over the range of visible wavelengths when contained within said air freshener, the total volume of which is V_I which decreases on use of said air freshener article whereby $dV_I/d\theta < 0$ each of which icon comprises (i) water, (ii) a clear gel matrix material selected from the group consisting of a polysaccharide gel matrix material and a hydrolyzed protein gel matrix material, (iii) optionally, a system-compatible air freshening fragrance composition and (iv) optionally, a surfactant,

with the proviso that the system-compatible air freshening fragrance compositions are present in at least one of said icons, or in said air freshener body, or in at least one of said icons and in said air freshener body, the volume fraction of said icons in said air freshener article being $\phi = V_I / (V_I + V_o)$, wherein $0.01 \leq \phi \leq 0.90$, the physical and chemical properties of each of said icons and said air freshener body being such that on use of said air freshener article, (i) the rate of volumetric reduction of each of said icons as a result of fragrance emission, if any, and water emission therefrom with respect to the volumetric reduction of the air freshener body which envelops said icons as a result of fragrance emission, if any, and water emission therefrom is a constant, according to the equations: $\partial V_I / \partial V_o = \phi / (1 - \phi)$ and $\partial^2 V_I / \partial V_o^2 = 0$, (ii) the integrity of the fragrance compositions emitted from said air freshener body and said icons is maintained and (iii)

the distinguishing visibility of the icons in said air freshener from without said air freshener, at visible wavelengths, is maintained.

2. The air freshener article of claim 1 wherein the air freshener body additionally comprises at least one additive selected from the group consisting of an antimicrobial agent; an anti-oxidant; a non-gelling hydrocolloid; a chelating agent; a C₂-C₆ alkylene glycol; a lower alkanol; and a C₂-C₆ (mono- or di-) alkylene glycol-C₂-C₄ alkyl ether.

3. The air freshener article of claim 1 wherein the icons additionally comprise at least one additive selected from the group consisting of an opacifying agent; an anti-microbial agent; an anti-oxidant; a non-gelling hydrocolloid; a chelating agent; a C₂-C₆ alkylene glycol; a lower alkanol; and a C₂-C₆ (mono- or di-) alkylene glycol mono-C₂-C₄ alkyl ether.

4. The air freshener article of claim 1 wherein the clear gel matrix material is a polysaccharide and the polysaccharide is selected from the group consisting of gellan gum, alkali metal salts of alginic acid, alkaline earth metal salts of alginic acid, and carageenan.

5. The air freshener article of claim 1 wherein the clear gel matrix material is a hydrolyzed protein gel matrix which is gelatin having an isoelectric point of from about 4 up to about 7.

6. The air freshener article of claim 2 wherein the air freshener body comprises an antimicrobial agent, a chelating agent, a lower alkanol, a C₂-C₆ (mono- or di-) alkylene glycol C₂-C₄ alkyl ether and a C₂-C₆ alkylene glycol, and the antimicrobial agent is selected from the group consisting of potassium dimethyldithiocarbamate, glutaraldehyde, 2-bromo-2-nitropropane-1,3-diol, o-phenyl phenol, 1-(3-chloroallyl)-3,5,7-triaza-1-azoniaadamantane chloride, N,N'-dimethyl-5,5-dimethoxy-2,4-imidazolidinedione, methylchloroisothiazolinone and methylisothiazolinone; the

chelating agent is selected from the group consisting of an alkali metal salt of citric acid, an ammonium salt of citric acid, an alkali metal salt of ethylenediamine tetraacetic acid, an ammonium salt of ethylene diamine tetraacetic acid, an alkali metal salt of N-hydroxyethylenediamine triacetic acid, an ammonium salt of N-hydroxyethylene-diaminetriacetic acid, an alkali metal salt of iminodisuccinic acid, an ammonium salt of iminodisuccinic acid, an alkali metal salt of ethylenediamine disuccinic acid and an ammonium salt of ethylene diamine disuccinic acid; the C₂-C₆ alkylene glycol is 1,2-propylene glycol; and the C₂-C₆ (mono- or di-) alkylene glycol C₂-C₄ alkyl ether is dipropylene glycol-n-butyl ether.

7. The air freshener article of claim 1 wherein the air freshener body is fully surrounded by a clear substantially solid or semi-solid microporous boundary surface permitting passage of water molecules and fragrance composition component molecules therethrough on use of said article.

8. The air freshener article of claim 1 supported by means of an external support comprising a solid base having vertically-disposed solid sidewalls extending therefrom.

9. The air freshener article of claim 1 wherein an air freshening fragrance composition is contained within said air freshener body immediately prior to use of said article, and the air freshening fragrance composition consists essentially of fragrance components each of which has a $C \log_{10} P$ of from about 1 up to about 4 wherein P is the octanol/water partition coefficient for each of said fragrance components.

10. The air freshener article of claim 1 wherein at least one of said icons contains an air freshening fragrance composition prior to use of said article, and the air freshening fragrance composition consists essentially of fragrance components each of which has a $C \log_{10} P$ of from about 1 up to about 8 wherein P is the octanol/water partition coefficient for each of said fragrance components.

11. The air freshener article of claim 1 wherein at least one of said icons contains an air freshening fragrance composition prior to use of said article, and, in addition, a surfactant having a hydrophile/lipophile balance of less than about 10, and the air freshening fragrance composition consists essentially of fragrance components, each of which has a $\text{Clog}_{10}P$ of from about 1 up to about 8 wherein P is the octanol/water partition coefficient for each of said fragrance components.

12. The air freshener article of claim 1 wherein the surfactant contained in the gel matrix air freshener body has a hydrophile/lipophile balance in the range of from about 10 up to about 30.

13. The air freshener article of claim 12 wherein the surfactant contained in the gel matrix air freshener body is selected from the group consisting of poly ($\text{C}_2\text{-C}_4$ alkylene glycol)₆₋₃₀ mono ([$\text{C}_8\text{-C}_{10}$ alkyl]phenyl)ethers; 1, ω -poly $\text{C}_2\text{-C}_4$ alkylene glycols; poly $\text{C}_2\text{-C}_4$ alkylene glycol mono- $\text{C}_{10}\text{-C}_{20}$ alkanolic acid esters; poly $\text{C}_2\text{-C}_4$ alkylene glycol sorbitan mono- $\text{C}_{10}\text{-C}_{20}$ alkanolic acid esters; poly $\text{C}_2\text{-C}_4$ alkylene glycol tallow amines; poly $\text{C}_2\text{-C}_4$ alkylene glycol esters of tall oil fatty acids; and poly $\text{C}_2\text{-C}_4$ alkylene glycol mono- $\text{C}_{10}\text{-C}_{20}$ alkyl ethers.

14. The air freshener article of claim 3 wherein the icons comprise at least one opacifying agent and the opacifying agent is selected from the group consisting of iron oxide yellow, iron oxide cosmetic russet, cloisonne super rouge, cloisonne super rouge with polyflake, graphtol blue powder, graphtol green powder, titanium dioxide and Lake colors.

15. The air freshener article of claim 1 wherein the weight percent of water in said article is from about 50% up to about 90% of said article; the weight percent of clear gel matrix material is from about 0.1% up to about 10% by weight of said article; the weight percent of system-compatible fragrance in said article is from about 0.1% up to about 20% by weight of said article and the weight percent of surfactant in said article is from about 0.1% up to about 25% by weight of said article.

16. The air freshener article of claim 1 wherein each of said icons and said air freshener body contains a system-compatible air freshening fragrance composition prior to use of said article, and on use of said article, the operation of the air freshener article is in accordance with the algorithm:

$$\int \{ (V_I [\partial c_I / \partial \theta] - V_o [\partial c_o / \partial \theta] + c_I [\partial V_I / \partial \theta] - c_o [\partial V_o / \partial \theta]) d\theta \} \\ = k_1 \Delta(c_o V_o) + (1 - \phi) \iint [\partial E_o / \partial V_o] dV_o d\theta + \phi \iint [\partial E_I / \partial V_I] dV_I d\theta$$

wherein V_I is the total volume of the icons at time θ ;

wherein V_o is the air freshener body volume at time θ ;

wherein c_I is the average perfume composition component concentration in gram-moles per liter in all of the icons at time θ ;

wherein c_o is the average perfume composition component concentration in gram-moles per liter in the air-freshener body at time θ ;

wherein E_o is the elastic modulus of the air freshener body at time θ ;

wherein E_I is the average elastic modulus of each of the icons at time θ ;

wherein k_1 is a constant; and

wherein ϕ is the volume fraction of the icons.

17. The air freshener article of claim 1 wherein each of said icons and said air freshener body contains a system-compatible air freshening fragrance composition prior to use of said article, and on use of said article, the operation of the air freshener article is in accordance with the algorithm:

$$\Delta(V_o^{-1/2}) + \Delta(V_I^{-1/2}) - \Delta(\ln c_I) - \Delta(\ln c_o) = -k_2(\Delta\theta)$$

wherein V_I is the total volume of the icons at time θ ;

wherein V_o is the air freshener body volume;

wherein c_I is the average perfume composition component concentration in gram-moles per liter in all of the icons at time θ ;

wherein c_o is the average perfume composition component concentration in gram-moles per liter in the air freshener body at time θ ; and

wherein k_2 is a constant.

18. The air freshener article of claim 1 wherein each of said icons and said air freshener body contains a system-compatible air freshening fragrance composition prior to use of said article, and on use of said article, the operation of the air freshener article is in accordance with the algorithm:

$$(c_{I2}c_{o2})/(c_{I1}c_{o1}) = \exp[k_2\Delta\theta + \Delta(V_o^{-1/2}) + \Delta(V_I^{-1/2})]$$

wherein V_I is the total volume of the icons at time θ ;

wherein V_o is the total air freshener body volume at time θ ;

wherein c_{I1} is the average perfume composition component concentration in gram-moles per liter in all of the icons at time θ_1 ;

wherein c_{I2} is the average perfume composition component concentration in gram-moles per liter in all of the icons at time θ_2 ;

wherein c_{o1} is the average perfume composition component concentration in gram-moles per liter in the air freshener body at time θ_1 ;

wherein c_{o2} is the average perfume composition component concentration in gram-moles per liter in the air freshener body at time θ_2 ; and

wherein k_2 is a constant.

19. A process for preparing the air freshener article of claim 1 comprising the steps of:

- (a) providing at least one icon;
- (b) cooling said icon to a temperature below the freezing point thereof;
- (c) providing said air freshener body in the liquid phase; and
- (d) immersing said icon in said air freshener body.

20. The process of claim 19 comprising the steps of :

- (a) admixing the clear gel matrix material with water at a temperature in the range of from about 65°C. up to about 80°C. to form an aqueous gel matrix solution;
- (b) dividing the resulting solution into two portions: (i) an "icon" portion; and (ii) a "body" portion, the volume fraction ϕ of the "icon" portion being $\phi = V_I' / (V_O' + V_I')$; wherein $0.01 \leq \phi \leq 0.90$ and wherein V_I' is the volume of the "icon" portion and V_O' is the volume of the "body" portion;
- (c) maintaining the "body" portion in the liquid state at a temperature of from about 65°C. up to about 80°C.
- (d) pouring the "icon" portion into one or more icon molds;
- (e) optionally adding one or more of the same or different pigments to one or more of the icon molds containing the "icon" portion while the "icon" portion is in the liquid state;
- (f) cooling the "icon" portion to a temperature below the solidification temperature of the "icon" portion whereby one or more frozen icons in the solid state are formed;
- (g) removing the one or more frozen icons in the solid state from the one or more icon molds;
- (h) permanently submerging the entirety of the one or more frozen icons in the "body" portion whereby the one or more frozen icons is suspended in the "body" portion; and
- (i) within a time period sufficiently short in length to prevent the melting of the one or more suspended icons, cooling the resulting suspension to a temperature in the

range of from about 10°C. up to about 30°C. whereby the resulting suspension is transformed to the solid or semi-solid phase.

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